

ISSN(E):2522-2260
ISSN(P):2522-2252

Indexing/Abstracting



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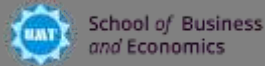
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Published by

Department of Quantitative Methods



University of Management and
Technology, Lahore, Pakistan

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Manuscript Information

Citation in APA Style

Muhammad, M., & Riaz, U. (2018). Disaggregated Imports Demand Functions: An Empirical Analysis for Pakistan. *Journal of Quantitative Methods* 2(2), 7-27.

This manuscript contains references to 34 other manuscripts.

The online version of this manuscript can be found at

<https://journals.umt.edu.pk/sbe/jqm/volume2issue2.aspx#>

DOI: <https://doi.org/10.29145/2018/jqm/020202>

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Disaggregated Imports Demand Functions: An Empirical Analysis for Pakistan

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Abstract

Given the importance of international trade in the economic performance of a country, voluminous research work has been carried out on the determinants of aggregate exports and imports. The present study departs from the conventional approach by analyzing demand of imports in a commodity-wise disaggregated fashion. As different products respond differently to trade policies and exchange rates, therefore policy makers can focus on the particular products when designing their policies for imports. Specifically, this study attempts to analyze the impact of prices, income level, foreign exchange reserves, exchange rate and trade liberalization program on 26 commodities defined by SITC 3-digit classification in which Pakistan has been most often a net importer. Using data for the period 1982 to 2010, GMM estimates reveal inelastic response of the major commodities to their own prices and are growth driven.

Keywords: Imports, Commodities, Elasticities, GMM

JEL Classification: F1, F14

1. Introduction

International trade is recognized as an engine of economic growth. It enhances the welfare of consumers by enabling them to have high quality of goods. It also helps in increasing the economic efficiency, division of labor, specialization, competitiveness

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Authors' Acknowledgment: We hereby declare that the given paper is extracted from our MPhil thesis.

(Thomas & Grosse, 2005; Al-Hazaimeh, Al-Hyari, & AL-Nasour, 2011) and is a vital source of inflow of advanced technology, skills, knowledge and expertise (Yasmin, Jehan & Chaudhary, 2006). During the early stages of economic growth and development, capital accumulation, labor force, skills and technological know-how is generally low and domestic supply of resources alone cannot fulfill this requirement. Imports from the rest of the world cover this deficiency.

Expected performance of trade policies depends on the determinants of exports and imports. Different commodities/sectors respond differently to the trade and exchange rate policies of a country. For example, it may be useful to curtail imports by increasing tariffs on categories having higher price elasticities. However, the same policy will be fruitless for commodities having low price elasticities. Therefore, targeted policies will be a better option if the behavior of imports across different categories is not similar. Most of the studies have concentrated on the aggregate imports demand which leads to aggregation bias. Therefore, an understanding of imports' elasticities at commodities/sector level is utmost important for policy makers (Khan, 1975; Sarmad, Mahmood & Syed, 1985; Sarmad & Mahmood, 1987; Ahmad, 2011).

Trade balance of Pakistan has remained in deficit for most of its economic history since independence, which has in turn resulted into high stacks of foreign debt liabilities. Keeping in view a heavy dependence of Pakistan's economy on imports of different commodities, the current study explores the responsiveness of different commodities to different policy variables. We estimate import demand function for 26 commodities over the period of 1982-2010. These includes Tea, Natural Rubber, Jute, Synthetic Fiber, Crude fertilizer, Iron Ore and Concentrates, Coal, Crude oil and Petroleum Products, Vegetable Oil, Inorganic Chemicals, Synthetic Dyes, Paints/ Varnishes, Pharm Products, Pesticides, Rubber Articles, Paper & Board, Mineral Manufactures, Pig Iron, Iron Bars and Sheets, Iron Plate, Copper, Aluminum, Office Machines, TV Receivers and Passenger Vehicles. Results of GMM estimates show that almost all commodities are normal and are growth driven. More than half of the commodities are inelastic in nature showing that they are essential in nature.

2. Literature Review

Voluminous empirical research has been carried out on the import demand function, especially to find price and income elasticities, at disaggregate level. A study by Athukorala and Menon (1995) explores aggregation bias for ten Australian imports products by finding price elasticity for total imports equal to -0.67 while for category-wise, it ranges from -0.37 to -2.10 for eight out of ten products. Tambi(1998) documents negative long run and short run relative import price elasticities for consumer goods, capital goods, intermediate goods, raw materials and total merchandise goods of Cameroonian economy. High sensitivity of consumer goods and raw materials to change in relative import price is found which indicates that more substitutes are available in domestic market for these imports. Low foreign exchange rate elasticities coupled with the low income elasticities for total consumer goods, merchandise goods and raw materials reflect that Cameroon economy is not more open to foreign trade. Pattichis (1999) for Cyprus shows that imports demand of rice, maize, milk powder and butter is inelastic to relative price change as these products are not produced in Cyprus. Rice and milk powder are found to be inferior as their income elasticities are negative.

Cheong (2002) investigates the relationship between disaggregated import demand and expenditure components for Malaysia. Imports are disaggregated into consumption, investment and intermediate goods while the expenditure components are consumption expenditure, investment expenditure and exports. The study finds that different imports components behave differently to different variables both in the short and long run.

Thomakos & Ulubaşoglu (2002) finds significant impact of trade liberalization program of 1980s on imports of twenty six commodities of Turkish economy. Results of the study also indicate variation in the price elasticities ranging between 0 and -2 for 19 commodities and more than -2 for 7 commodities. The income elasticity for most of the products is less than unity showing that a limited amount of increase in income is channeled to imports. Tennakoon (2010), for Sri Lanka, finds that import demands for consumer goods, intermediate goods, and investment goods are

inelastic to relative import price. However, among the three categories, an import for consumer's goods is more responsive suggesting an adequate availability of their substitutes at the domestic level. Foreign exchange has significant impact on intermediate and investment goods while its impact is insignificant on imports of consumer goods. Grullon (2012) finds, for Dominican Republic, that import demand of the four products (services, merchandise, petroleum and other products) is less responsive to relative prices and more responsive to domestic income.

Though there is an ample research work at international level, but limited research is available on import demand at commodity-wise for Pakistan¹. For example Sarmad, Mahmood and Syed (1985) find aggregation bias at aggregate level of imports. Their results also indicate a considerable variation in the price and income elasticities of different consumer goods. Study by Sarmad and Mahmood (1987) shows that both relative price level and activity variable elasticities vary across the commodities. The relative price elasticities are quite small showing that low substitutability of the domestic goods to imported goods. The higher estimates of activity variable show the high outward orientation or openness of the economy during the study period. The results of Ahmad (2011) show existence of co-integration among aggregate imports, the main components of final expenditure and the relative price. The findings of the disaggregated imports demand functions show that the relative imports price and relevant macroeconomic variables elasticities have the expected sign for all the categories of imports. The private consumption expenditure is found to be the major determinant of aggregate import as well as of all the categories except for vehicle imports.

Existing literature on import demand shows a considerable variation in results. It may be due to difference in the set of endogenous and exogenous variables, study time period, country or region and methodological framework. Furthermore, limited studies on imports demand at disaggregated level are available for Pakistan and provide mixed evidences. Therefore this study is an attempt to investigate the determinants of imports of twenty six commodities at disaggregated level for Pakistan economy. This will help the policy makers in designing an appropriate import policy. The specific objectives of the studies are:

- To evaluate the extent to which import prices and domestic income influence the import demands of different commodities.
- To find out the effect of other factors like exchange rate, foreign exchange reserves and trade liberalization programs on the imports of different commodities.

3. Model Specification

Although a vast body of literature is available on trade modeling in general, the question as to how exports and imports models could be appropriately specified is really a matter of interest. Different methods and frameworks are used for modeling trade, which in turn depend on factors like; data availability, the types of traded goods and the final purpose of the model; whether the model is meant for hypothesis testing or for the purpose of forecasting.

Two standard trade models, the perfect and imperfect substitute models, are used in most of the international trade analysis. The first model assumes perfect substitutability of domestic and imported goods. Under this assumption, a country could be either an exporter or an importer of a traded good, but not both. Since this assumption contradicts the real world behavior, the perfect substitution model is of little use in the empirical trade literature. Most of the studies have therefore incorporated the imperfect substitute models. The key assumption underlying this model is that the imports are not perfect substitute for domestic goods as both coexist in the market. The model assumes that households allocate their budgets to domestic and imported goods in order to maximize their utility, given the prices of goods and their budget constraints. Same is the case with intermediate and capital goods, for which the firms want to minimize their costs, given input prices and level of production. Since imperfect substitute model is more realistic as compared to the perfect substitute model, we prefer to use it in this study.

In order to formulate the exports and imports models in the context of demand-supply relationship, the trade theory emphasizes on the simultaneous relationship between exports and imports quantities and their respective prices. In order to avoid any possibility of biasedness in the results, it is advisable that supply and demand functions of imports and exports should be simultaneously considered

in the system. Since our study concentrates on the import demand equations, an important assumption is made to the supply side relationship. Typically, it is assumed that the price elasticities of import supplies faced by any individual and particularly a small country are infinite. This assumption is quite reasonable in the sense that the import demand by a small country can be easily met from the rest of the world at the going prices. This is referred to “importance of being unimportant” in the literature. It means that imports supply can be treated as perfectly elastic for a small country without any loss of precision. This allows us to use single equation method in estimating the import demand equation, in which the price variables may be treated as exogenously given. The share of Pakistan in the total imports of the world is quite small. Therefore, rest of the world can increase its supply of imports to Pakistan without an increase in prices. The small country assumption reduces the complexity of the simultaneous equations model to a great extent.

With this background, the standard specification of the import demand function may be expressed, following Khan (1975), Carone (1996) and Sultan (2011), in terms of real income of the country and relative prices of the imports. Therefore, we specify the demand for disaggregated imports in the simplest form; that is, the quantity demand of the i^{th} imported commodity (M_t^i) is related to its own price relative to the price of domestic competing commodity (RPM_t^i) and to the level of domestic income (Y_t) at time “ t ”. This is given below in the general form:

$$M_t^i = f(Y_t, RPM_t^i) \quad (1)$$

Since consumers have different perceptions regarding the demand for imported goods and domestically produced goods, therefore, they are expected to respond differently to the changes in import prices (PM) and domestic prices (PD). Therefore, the use of relative price in equation (1) may lead to misspecification of the model and hence may produce biased results. Following Warner and Kreinin (1983) and Kabir (1988), we introduce international and domestic prices separately. Further, Studies like Junz and Rhomberg (1973), Wilson and Takacs (1979), Warner and Kreinin (1983) and Kabir (1988) have also found that trade flows respond differently to changes in exchange rate and changes in foreign imports prices. So, to find the effect of exchange rate on the imports flows, we decompose

the imports prices into foreign currency import prices and the exchange rate. This specification splits the effects of the changes in the real exchange rate on trade flows into nominal exchange rate (ER) and price components. Thus imports demand function can be written as given below in equation (2):

$$M_t^i = f(Y_t, PM_t^i, PD_t^i, ER_t) \quad (2)$$

Moreover, foreign exchange reserves (FER) may also affect import demand particularly in a developing country (Hemphill, 1974; Moran, 1989; Babatunde & Egwaikhide, 2010). These reserves act as liquidity constraint to import demand. Without adequate level of foreign exchange reserves, it is not feasible to materialize the desired level of imports. Further, Pakistan initiated its trade liberalization program in the late eighties. To capture the effect of trade liberalization we introduce dummy variable (DTL) which takes value “0” for the years before 1989 and “1” for the years after 1989. Now equation (2) becomes:

$$M_t^i = f(Y_t, PM_t^i, PD_t^i, ER_t, FER_t, DTL_t) \quad (3)$$

For empirical estimation of equation (3) researchers use both linear and log-linear forms. However, the log-linear models are preferred over simple linear models as they allow interpretation of the coefficients directly as elasticities and also accommodate the problem of heteroscedasticity and multi-collinearity (Sultan, 2011). Therefore we use log-linear form of equation (3) as:

$$\ln M_{it} = \alpha_0 + \alpha_1 \ln PM_{it} + \alpha_2 \ln PD_{it} + \alpha_3 \ln Y_t + \alpha_4 \ln FER_t + \alpha_5 \ln ER_t + \alpha_6 DTL + \varepsilon_t \quad (4)$$

where ε_t is stochastic error term.

4. Data Description, Sources and Estimation Methodology

We estimate import demand equation for 26 products disaggregated at the 3-digit level of Standard International Trade Classification (SITC), Revision 2, for the period of 1982 to 2010. Selection of the period is on the basis of availability of data and also on the basis of change in the exchange rate regime from fixed to flexible exchange rate. We select those products in which Pakistan is net importer. Details of the variables are given below:

The variable *import quantity* of each product is retrieved from the UN Commodity Trade Statistics (Comtrade) database at the 3-digit SITC level of aggregation. The quantity data is industry/product specific. Majority of the products are measured in physical units like kilogram or liters etc. while some are also measured in the number of items. However, it does not create problems in estimation provided the unit of measurement is consistent across the time series for each of the product (Jones, 2008; Jones & Morrissey, 2008). Since data on the actual import prices is not available, we rely on the *unit import prices* following the common practice².

For *domestic prices* (i.e. prices of domestically produced substitutes of imported goods), the data is taken from the Pakistan Statistical Yearbook (various issues). Since it is difficult to compare categories in the domestic price series with the three-digit SITC trade categories, we have selected the wholesale price index series of the close substitutes of the imported good³. Activity level variable, *Gross Domestic Product*, *Foreign exchange reserves* and *Nominal exchange rate* are taken from World Development Indicators, 2011. For *Trade liberalization* we use dummy variable which takes value “0” for the period from 1982 to 1988 and ‘1’ for the period from 1989 to 2010⁴.

Equation (4) is our main equation for finding determinants of imports of 26 different commodities. However, there exists a problem of endogeneity in our model due to the presence of two way causation between price variables (PM and PD) and import demand (M). To handle this problem we use instrumental variable technique, Generalized Method of Moments (GMM). Although our sample size is relatively small but we prefer GMM over 2SLS due to two reasons. First due to time series nature of our data, there is inherent problem of autocorrelation in our model. Unlike 2SLS, GMM reports autocorrelation and heteroscedasticity consistent standard errors. Second unlike 2SLS which is confined to exact identified equations, GMM can be used even in case of over identified equations where we can use number of instruments greater than number of parameters to be estimated. Due to these reasons we use GMM as our estimation technique.

5. Results

We have estimated twenty six equations for twenty six imported products, each for the data period 1982-2010. GMM results⁵ are given below in Table 1.

5.1. Tea SITC (074)

Small magnitude of import price elasticity (-0.49) shows that tea is an essential item⁶. The domestic price elasticity is 0.824 indicating that domestic production is less important. The income elasticity is 0.303; which reveals that tea is a necessity. Foreign exchange reserves do not affect the import demand of tea as shown by its low and insignificant elasticity. The exchange rate elasticity (-1.234) reveals that depreciation of Pakistan's currency would decrease tea imports. Further, results also show that Trade liberalization Program has significant positive impact on tea imports.

5.2. Crude Materials, Inedible - except Fuels (SITC 2)

We have selected 5 products within this group in which Pakistan is the net importer, namely Natural Rubber, Jute, Synthetic Fiber, Crude fertilizer, Iron Ore and Concentrates.

The import price elasticity of natural rubber (-2.78) shows the dependency of Pakistan on this good. Domestic price is not available due to the limited domestic production. The income elasticity is insignificant reflecting that level of income is not important in the import demand of natural rubber. Foreign exchange reserves (0.48) and the trade liberalization (1.08) have positive impacts while the exchange rate (-1.1) has negative impact on import of natural rubber.

The low import price elasticity (-0.497) of Jute shows that it is an essential product. The income elasticity is positive (1.142) and is significant which shows an increase in the imports of Jute with the increase in level of income.

Table 1: GMM Estimates of Imports' Demand

Product Group	Constant	PM	PD	Y	EFR	ER	DTL	F-Statistics
Tea	2.25**	-0.49*	0.82*	0.30**	0.032	-1.23*	0.24*	5.2
Natural Rubber	-2.78	-0.56***	N/A	0.5	0.48**	-1.1***	1.08*	0.94
Jute	-6.038**	-0.497**	1.115	1.142*	0.037	-2.120**	0.162	4.072
Synthetic Fiber	-23.5*	0.55	2.36**	1.88*	-0.008	-0.99***	-0.66**	6.25
Crude Fertilizer	-1.08	-0.45**	0.035	0.56***	0.14**	-0.59**	0.302**	2.82
Iron Ore/Concentrates	-42.86*	-2.34*	1.37	4.93*	-0.035	-1.77**	0.26***	4.85
Coal	-14.11***	-0.23	1.21***	1.68***	0.32**	-1.587**	0.012	27.89
Crude Oil	18.25*	0.23**	N/A	1.22*	0.19*	0.73**	0.18	7.64
Petroleum Products	-25.11*	-0.83*	0.719**	3.521*	-0.11***	-0.870**	-0.15	51.1
Vegetable Oil	20.42*	-0.95*	6.72*	1.052**	-0.38*	-8.14*	-0.01	6.2
Inorganic Chemicals	-12.03*	-1.47*	1.07***	1.28*	-0.012	-0.83*	-0.48**	52.23
Synthetic Dyes	-13.6*	-0.95*	1.22*	1.4*	0.12*	-1.13*	0.21**	162.9
Paints/ Varnishes	-8.84***	-1.13***	-0.19	1.22*	0.002	-0.25	0.87*	27.36
Pharm. Products	-11.74*	-0.95*	0.71*	1.7*	-0.04	-1.21*	0.003	6.11
Pesticides	4.3**	0.66***	n.a.	0.70**	0.064	-1.51*	-0.37*	12.4
Rubber Articles	-19.62*	-0.95*	-0.43	2.62*	0.113	-1.93*	-0.12	24.6
Paper & Board	-8.31*	-1.10*	0.37*	1.56*	0.06**	-0.88*	0.21*	29.85
Mineral Manufactures	-13.5*	-0.913*	-0.613	2.004*	0.036	-1.75**	0.24	23.41
Pig Iron	-26.8***	-1.3*	-1.06	3.38***	-0.39**	-0.16***	0.44***	18.4

Table 1: GMM Estimates of Imports' Demand

Product Group	Constant	PM	PD	Y	EFR	ER	DTL	F-Statistics
Iron Bars and Sheets	-22.8	-0.81**	0.48	2.88	0.074	-2.34*	-0.073	31.98
Iron Plate	-17.86*	-1.27*	-0.59**	2.61*	-0.015	-0.96**	0.51*	32.81
Copper	-7.8	-0.86*	N/A	1.16***	0.49*	-1.44*	0.18	8.12
Aluminum	-9.83*	-0.99*	0.036	1.41*	0.141**	-0.84*	0.205	85.5
Office Machines	-12.03*	-1.47*	1.07***	1.28*	-0.012	-0.83*	-0.48**	52.23
TV Receivers	-70.09**	-1.77*	7.16***	5.35**	0.26	-5.66**	3.44*	14.01
Passenger Vehicles	11.97*	-0.97*	0.37	1.87*	0.11	-1.76**	0.47**	129.7

Note: * where $P < 0.01$, ** $P < 0.05$, *** $P < 0.1$

The exchange rate has negative (-2.120) impact on Jute import demand. Domestic price, foreign exchange reserves and trade liberalization program have insignificant impact on the imports of Jute. The estimated import price elasticity of synthetic fiber is insignificant while domestic price elasticity (2.356) and income elasticity (1.877) are positive and significant showing that domestic price and income are the important determinants of the imports of synthetic fiber.

The impact of exchange rate (-0.999) and trade liberalization (-0.657) are negative and significant. However, the foreign exchange reserves elasticity is insignificant. The import price elasticity of Fertilizer is -0.452 and significant while domestic price elasticity is 0.035 but insignificant. The income, foreign exchange reserves and exchange rate elasticities are 0.560, 0.137 and 0.589 respectively. Import demand of Fertilizer increases with the trade liberalization as shown by its positive (0.302) coefficient. The import price elasticity of iron ore is negative (-2.344). However, the impact of domestic price is insignificant in the case of iron ore. Both income (4.938) and trade liberalization (0.262) have positive impacts. The foreign exchange reserves elasticity (-0.035) is insignificant and the exchange rate elasticity is negative (-1.766) and significant.

5.3. Mineral Fuels, Lubricants and Related Materials (SITC 3)

We have chosen three products: Coal, Crude oil and Petroleum Products from this group. The domestic price (1.212) income (1.677) and foreign exchange (0.316) have positive impact on the import demand of coal while the exchange rate (-1.587) negatively influences it. However, import price and trade liberalization have insignificant impacts on the import demand of coal. The import price elasticity of crude oil is positive (0.232)⁷ and is significant. Although this is against the conventional economic theory but it should not be a cause of surprise. This unexpected result may be due to the limited domestic production and hence heavy dependence on the imported crude oil. Due to its pivotal role in the economy, we are bound to import more to satisfy our growing domestic demand even if its price increases. The income (1.216), foreign exchange reserves (0.185), and exchange rate (0.733) have positive and significant impacts on the import demand of crude oil. The impact of exchange rate is also in contrast with theory. However, it seems plausible as we can see that

despite the continuous depreciation of Pakistani currency, our imports of crude oil couldn't reduce. Results also indicate that trade liberalization has nothing to do with the crude oil imports as its impact is insignificant. Import price elasticity of petroleum product is significantly negative with magnitude of -0.828 showing an inelastic demand. The domestic price elasticity has the expected positive sign having value of 0.719 and is significant. Income elasticity is 3.521 which reveal that imports of petroleum products are highly elastic with respect to income. Both foreign exchange reserves and trade liberalization program are insignificant in case of petroleum product. The exchange rate elasticity is -0.870 and significant.

5.4. Animal and Vegetable Oils, Fats and Waxes (SITC 4)

From the animal and vegetable oils group, we have chosen only vegetable oil. It includes both palm and soybean oil. The estimated results show that import price elasticity is negative and approximately equals unity (-0.945). This result may be due to fairly large number of close substitutes like domestic banaspati ghee, butter ghee and cooking oil produced in the domestic market. The domestic price elasticity is very high (6.71) due the close substitutability between the domestic and imported products. Income elasticity is also positive with value of 1.052. The foreign exchange reserves and the exchange rate elasticities are -0.377 and -8.135 respectively. Result also shows that Pakistan's trade liberalization program has no significant impact on the import of vegetable oil.

5.5. Chemicals and Related Products (SITC 5)

We have selected 5 products namely; Other Inorganic Chemicals, Synthetic Dye, Paints and Varnishes, Pharmaceutical Products and Pesticides. Import price and domestic price elasticities of "Other Inorganic Chemicals" -1.467 and 1.065 respectively. Both the elasticities are greater than unity, thus showing the elastic nature of import demand with respect to prices. The income elasticity is positive with magnitude of 1.284. The exchange rate (-0.830) and trade liberalization (-0.840) have negative impacts on the import demand of "Other Inorganic Chemicals" and the foreign exchange reserves are insignificant. Import elasticities of "Synthetic Dye" with respect to import price and domestic price -0.953 and 1.216 respectively. The income elasticity is more than unity having value of 1.388 and the foreign exchange reserves elasticity is 0.124.

The exchange rate elasticity -1.134 and that of trade liberalization is 0.208. The estimated import price elasticity of “Paints and Varnishes” is -1.134 and the domestic price elasticity is insignificant. The income elasticity is positive having a value of 1.219. The foreign exchange reserves elasticity is insignificant. The exchange rate elasticity is -0.248 and that of trade liberalization is 0.87. In case of “Pharmaceuticals Goods” the relevant elasticities for import price and domestic price have the correct signs, with magnitudes of -0.952 and 0.707 respectively. The income elasticity has positive sign, having magnitude of 1.697. The foreign exchange reserves elasticity estimate has opposite sign with the value of -0.037 but is insignificant. This means that foreign exchange reserves have no effect on the imports of pharmaceutical goods. The exchange rate elasticity is -1.206. The impact of trade liberalization is small (0.002) and insignificant.

Being an agricultural country, Pakistan imports a high amount of pesticides and related products as these are used in combination with fertilizers to enhance production in the agriculture sector. The import price elasticity of pesticides is 0.656. This unexpected sign may be due to the fact that speculators perceive initial price increase as an indication of further rise in price. Resultantly, the farmers demand more pesticides and an increase in the import is observed. The income elasticity has the expected positive sign having value 0.700. The magnitude is less than unity showing that pesticides are a necessity. The foreign exchange reserves elasticity is insignificant. This shows that changes in the foreign exchange reserves do not have significant impact on the imports of pesticides. The exchange rate elasticity has negative sign having magnitude -1.512. The impact of trade liberalization is negative having value -0.365.

5.6. Manufactured Goods (SITC 6)

We have selected eight products from this sector namely; Articles of Rubber, Paper and Paperboard, Minerals Manufactured, Pig Iron, Iron Bars and Sheets, Iron Plates, Copper and Aluminum.

We can see that the import price elasticities of all the products have the expected negative sign and are highly significant. The coefficients of five products, namely Articles of Rubber, Minerals Manufactured, Iron Bars and Sheets, Copper and Aluminum are less than unity, showing that their import demand is inelastic to their

respective import prices. The import price elasticities of the three products; Paper and Paperboard, Pig Iron and Iron Plate are greater than unity, showing that their import demands are elastic with their respective import prices. The income elasticities are found to be positive ranging from 1.162 to 3.38 and are highly significant for all eight products. The foreign exchange reserves elasticities are mixed very low and positive for some of the products, negative and insignificant for others. The exchange rate elasticities are negative and significant for all the eight products. It is greater than unity for four out of eight products, showing that changes in the exchange rate have significant effects on their imports. The impact of trade liberalization is positive on six products but significant only for three products.

5.7. Machinery and Transport Equipment (SITC7)

We selected Office Machines, Television Receivers and Passengers Vehicles. It can be seen from the above Table that in case of imports demand of "Office Machine", import price and domestic price elasticities are -1.467 and 1.065 respectively. Since both the elasticities are greater than unity, it means that the import demand is elastic and responsive to the changes in both the import prices and domestic prices. The income elasticity is greater than unity (1.284) showing a high response of the imports of office machine to the changes in income. The foreign exchange reserves are found insignificant. The exchange rate elasticity is -0.830 and trade liberalization dummy appears with the negative sign (-0.480). The estimated import price and domestic price elasticities of "Television Receivers" are -1.774 and 7.164 respectively. The income elasticity is 5.349. The foreign exchange reserves elasticity is 0.262 but is insignificant. The exchange rate elasticity is -5.658 and significant. The trade liberalization dummy has positive sign with value 3.439. This means that through trade liberalization program imports of television receivers have increased.

In case of import of Passenger Vehicles, the import price elasticity is -0.972. Since the elasticity is nearly unity which means that an increase in the import prices results into a proportionate decrease in the import demand. The domestic price elasticity is insignificant. The income elasticity is greater than unity (1.873) showing that the imports are responsive to the changes in income. The foreign exchange reserves elasticity is 0.112 but insignificant. It

means that changes in the foreign exchange reserves do not affect import demand. The exchange rate elasticity is -1.755. The trade liberalization dummy bears coefficient equal to 0.469 and significant.

6. Conclusion

Estimates of the import demand functions for 26 commodities show that almost all the products are normal goods. Out of these, 15 products have inelastic import demand; 7 products have moderately elastic import demand, and 1 product is highly elastic. Three of the products are found with opposite sign (i.e.; positive) which is in contrast to conventional law of demand.

Given the inelastic response of most of the products to their respective import prices, the products under investigation can be considered as essential items. Majority of the goods are intermediate or capital goods. For most of the products, domestic (cross) price elasticities have the expected positive sign and also significant. The income elasticities of 22 products are greater than unity, reflecting the growth driven nature of these products. The high income elasticity reveals that income growth is likely to deteriorate the trade balance of Pakistan, *ceteris paribus*. The foreign exchange reserves are found statistically insignificant for majority of the products. For most of the cases, the exchange rate elasticities are found to be greater or close to unity in absolute terms, showing that devaluation may be used as a policy instrument for curtailing the imports of these products. The trade liberalization has mixed effects on the imports products under reference.

The findings of this study have profound policy implications for the imports demand in Pakistan. The results reveal that imports (own) prices, domestic income (GDP) and exchange rate are the prominent determinants of 26 key imports having strong consumption and production usage. Based on the inelastic response of the major imports to their own prices, it can be said that Pakistan is constrained by the natural resource endowments and technology in the production and availability of these products. The traditional solution suggests for levying tariffs and custom duties on the imports of these products and that the revenues collected should be utilized towards the production of their substitutes at home failing which the country's trade deficit will further deteriorate. However, imposition of customs on the imports of necessities will only increase their prices. Further the

liberalization regime also disapproves this policy. The high income elasticities of most of the products show that Pakistan's major imports are growth driven. The government should effectively influence and manage the domestic demand through appropriate fiscal and monetary policies other than taxation.

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Footnotes

¹However, a considerable literature is available on the determinants of Pakistan's aggregate import demand. Some of the important studies are Khan (2013), Baluch and Bukhari (2012), Alam and Ahmad (2010), Alam and Ahmad (2011), Afzal (2007), Rehman (2007), Arize et al. (2004) and Afzal (2001).

²Price and Thornblade (1978); Pattichis (1999); Thomakos (2002); Jones (2008); and Jones and Morrissey (2008) have also used unit prices.

³In some cases we have used the proxy prices, for instance the price of nylon yarn instead of synthetic fiber, paper instead of paper and paper board, Audio Visual Instruments instead of TV Receivers, utensils instead of Aluminum, Transports instead of Passenger vehicles, Drugs and Medicines instead of Pharmaceutical Products.

⁴Afzal (2001) also uses dummy variable for Pakistan's Trade Liberalization program.

⁵Before using GMM, time series properties of all the variables were checked. All variables are integrated of the same order and the Co-integration test confirms that all the variables have long run equilibrium relationship.

⁶Pakistan is ranked 2nd largest importer of tea in the world. Top in the rank is UK

⁷Sun et al. (2010) also found positive sign of import price elasticity for China's crude oil import demand.